

WHAT IS CLAIMED IS:

1. An aqueous solution for forming a copper-to-resin bonding layer,
comprising:
 - (a) at least one type of acid selected from inorganic acid and
organic acid;
 - (b) tin salt or tin oxide;
 - (c) salt or oxide of at least one type of metal selected from the
group consisting of: silver, zinc, aluminum, titanium, bismuth,
chromium, iron, cobalt, nickel, palladium, gold, and platinum;
 - (d) a reaction accelerator; and
 - (e) a diffusive retaining solvent.
2. The solution according to claim 1,
wherein the inorganic acid is at least one selected from the group
consisting of: hydrochloric acid, sulfuric acid, nitric acid, fluoroboric acid,
and phosphoric acid.
3. The solution according to claim 1,
wherein the organic acid is at least one selected from the group
consisting of: carboxylic acid, alkanesulfonic acid, and aromatic sulfonic
acid.
4. The solution according to claim 3,
wherein the organic acid is at least one selected from the group
consisting of: formic acid, acetic acid, propionic acid, butyric acid,
methanesulfonic acid, ethanesulfonic acid, benzenesulfonic acid,
phenolsulfonic acid, and cresolsulfonic acid.
5. The solution according to claim 1,
wherein the concentration of the acid is in a range of 1 to 50
mass %.
6. The solution according to claim 1,
wherein the tin salt or tin oxide is at least one selected from the
group consisting of: stannous sulfate, stannic sulfate, stannous fluoroborate,
stannous fluoride, stannic fluoride, stannous nitrate, stannic nitrate,

stannous oxide, stannous chloride, stannic chloride, stannous formate, stannic formate, stannous acetate, and stannic acetate.

7. The solution according to claim 1,

5 wherein the concentration of the tin salt or tin oxide in terms of the concentration of tin is in a range of 0.05 to 10 mass %.

8. The solution according to claim 1,

10 wherein the salt or oxide of the at least one type of metal is at least one type of soluble salt or oxide selected from the group consisting of: Ag_2O , ZnO , Al_2O_3 , TiO_2 , Bi_2O_3 , Cr_2O_3 , AgCl , ZnI_2 , AlBr_3 , BiI_3 , FeCl_3 , PdCl_2 , AuCl , Ag_2SO_4 , $\text{Zn}(\text{NO}_3)_2$, $\text{Al}(\text{NO}_3)_3$, NiSO_4 , CoSO_4 , CH_3COOAg , and $(\text{HCOO})_2\text{Zn}$.

9. The solution according to claim 1,

15 wherein the concentration of the salt or oxide of the at least one type of metal in terms of the concentration of metal is 0.1 to 20 mass %.

10. The solution according to claim 1,

20 wherein the reaction accelerator is at least one compound selected from the group consisting of: thiourea, 1,3-dimethyl thiourea, 1,3-diethyl-2-thiourea, and thioglycolic acid.

11. The solution according to claim 1,

25 wherein the concentration of the reaction accelerator is in a range of 1 to 50 mass %.

12. The solution according to claim 1,

30 wherein the diffusive retaining solvent is at least one selected from glycol and glycol ester.

13. The solution according to claim 12,

35 wherein the diffusive retaining solvent is at least one selected from the group consisting of: ethylene glycol, diethylene glycol, propylene glycol, cellosolve, carbitol, and butyl carbitol.

14. The solution according to claim 1,

wherein the concentration of the diffusive retaining solvent is in a

range of 1 to 80 mass %.

15. A method of producing a copper-to-resin bonding layer, comprising:
bringing a surface of copper into contact with an aqueous solution
5 for forming a bonding layer for bonding resin, comprising:

- (a) at least one type of acid selected from inorganic acid and organic acid;
- (b) tin salt or tin oxide;
- (c) salt or oxide of at least one type of metal selected from the
10 group consisting of: silver, zinc, aluminum, titanium, bismuth, chromium, iron, cobalt, nickel, palladium, gold, and platinum;
- (d) a reaction accelerator; and
- (e) a diffusive retaining solvent,

so that an alloy layer of tin and the at least one type of metal selected in (c)
15 is formed on the surface of the copper, and

subsequently removing a portion of the alloy layer of the tin and the
at least one type of metal selected in (c) other than a portion of the alloy
layer that is a layer in which the copper, the tin, and the at least one type of
metal selected in (c) are diffused, so that a bonding layer for bonding resin
20 containing an alloy of copper, tin, and the at least one type of metal selected
in (c) is formed on a surface of copper.

16. The method according to claim 15,
wherein a condition under which the surface of the copper is
25 brought into contact with the bonding layer forming solution is a
temperature in a range of 10 to 70°C and a contact time of 5 seconds to 5
minutes.

17. The method according to claim 15,
30 wherein the portion of the alloy layer of the tin and the at least one
type of metal is removed by a method in which a portion of an alloy layer of
tin and metal is removed selectively using an etchant.

18. The method according to claim 15,
35 wherein the bonding layer for bonding resin formed on the copper
surface has a thickness of not more than 1 μm .

19. A layered product formed from copper and resin that is a layered product in which copper and resin are integrated,

wherein a bonding layer for bonding resin containing an alloy of copper, tin, and at least one type of metal selected from the group consisting of: silver, zinc, aluminum, titanium, bismuth, chromium, iron, cobalt, nickel, palladium, gold, and platinum is present on a surface of the copper that is in contact with the resin.